bromotrifluoroethylene), poly(vinylidene fluoride-trifluoroethylene-chlorofluoroethylene), and poly (vinylidene fluoride-trifluoroethylene-vinylidene chloride).

High strain and high dielectric constant polymer systems, high energy irradiated P(VDF-TrFE) copolymers, have been earlier disclosed. An advantage of the current terpolymer systems is that the irradiation step used with the copolymer systems is eliminated. This saves manufacture cost and improves the reliability and reproducibility of the electroactive polymer systems.

Polymers of the present invention are conveniently prepared or synthesized by polymerizing processing known in the art, such as suspension, emulsion, or solutions methods. Three monomers (i.e., VDF. TrFE, CFE) are selected and contacted or mixed in proportion in the presence of a suitable catalyst or initiator. The resultant terpolymer systems should have a convenient molecular weight suitable for use in electrical or electromechanical devices. The molecular weight of the polymer systems of the present invention is not limited. The molecular weight of terpolymers is preferably, but not limited to, higher than about 50,000, more preferably higher than 100,000, and yet more preferably from about 100,000 to about 300,000.

Although the present invention describes in detail certain embodiments, it is understood that variations and modifications exist known to those skilled in the art that are within the invention. Accordingly, the present invention is intended to encompass all such alternatives, modifications and variations that are within the scope of the invention as set forth in the following claims.

What is claimed is:

1. A polymer prepared by a polymerizing a mixture of three different monomers comprising:

(a) at least one monomer of vinylidene-fluoride;

(b) at least one monomer selected from the group consisting of trifluoroethylene and tetrafluoroethylene; and

(c) at least one monomer selected from the group consisting of tetrafluoroethylene; vinyl fluoride; perfluoro (methyl vinyl ether); bromotrifluoroethylene; chlorofluoroethylene; chlorotrifluoroethylene; and hexafluoropropylene;

wherein when said polymer is stretched to greater than its original length and thereafter annealed at a temperature below its melting point, it exhibits (1) an electrostrictive strain, at room temperature, of 3% or more when an electric field gradient of 100 megavolts per meter or greater is applied thereacross optionally; (2) a dielectric constant, at room temperature, of 40 or higher at 1 kHz; and (3) an elastic energy density, at room temperature, of 0.3 joules/cm^3 or higher.

2. The polymer of claim **1**, wherein said polymer is selected from the group consisting of polyvinylidene fluoride-trifluoroethylene-chlorofluoroethylene polyvinylidene fluoride-trifluoroethylene-chlorotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-chlorotrifluoroethylene, polyvinylidene fluoride-trifluoroethylene-hexafluoropropylene, polyvinylidene fluoride-tetrafluoroethylene-hexafluoropropylene, polyvinylidene fluoride-trifluoroethylene-tetrafluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-tetrafluoroethylene, polyvinylidene fluoride-trifluoroethylene-vinyl fluoride, polyvinylidene fluoride-tetrafluoroethylene-vinyl fluoride, polyvinylidene fluoride-trifluoroethylene-perfluoro(methyl vinyl ether), polyvinylidene fluoride-tetrafluoroethylene-perfluoro (methyl vinyl ether), polyvinylidene fluoride-trifluoroethylene-bromotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-bromotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-chlorofluoroethylene, polyvinylidene fluoride-trifluoroethylene-vinylidene chloride, and polyvinylidene fluoride-tetrafluoroethylene-vinylidene chloride.

3. An electrical or electromechanical device comprising at least one layer of a polymer of claim **1**.

4. The electrical or electromechanical device of claim **3**, wherein said polymer is selected from the group consisting of polyvinylidene fluoride-trifluoroethylene-chlorofluoroethylene, polyvinylidene fluoride-trifluoroethylene-chlorotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-chlorotrifluoroethylene, polyvinylidene fluoride-trifluoroethylene-hexafluoropropylene, polyvinylidene fluoride-tetrafluoroethylene-hexafluoropropylene, polyvinylidene fluoride-trifluoroethylene-tetrafluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-tetrafluoroethylene, polyvinylidene fluoride-trifluoroethylene-vinyl fluoride, polyvinylidene fluoride-tetrafluoroethylene-vinyl fluoride, polyvinylidene fluoride-trifluoroethylene-perfluoro(methyl vinyl ether), polyvinylidene fluoride-tetrafluoroethylene-perfluoro(methyl vinyl ether), polyvinylidene fluoride-trifluoroethylene-bromotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-bromotrifluoroethylene, polyvinylidene fluoride-tetrafluoroethylene-chlorofluoroethylene polyvinylidene fluoride-trifluoroethylene-vinylidene chloride, and polyvinylidene fluoride-tetrafluoroethylene-vinylidene chloride.

5. A polymer prepared by a polymerizing a mixture of three different monomers comprising:

(a) at least one monomer of vinylidene-fluoride;

(b) at least one monomer selected from the group consisting of trifluoroethylene and tetrafluoroethylene; and

(c) at least one monomer selected from the group consisting of tetrafluoroethylene; vinyl fluoride; perfluoro (methyl vinyl ether); bromotrifluoroethylene; chlorofluoroethylene; chlorotrifluoroethylene; and hexafluoropropylene;

wherein said polymer is stretched to greater than its original length and thereafter annealed at a temperature below its melting point such that it exhibits (1) an electrostrictive strain, at room temperature, of 3% or more when an electric field gradient of 100 megavolts per meter or greater is applied thereacross; (2) a dielectric constant, at room temperature, of 40 or higher at 1 kHz; (3) an elastic energy density, at room temperature, of 3 joules/cm^3 or higher; or (4) any combinations thereof.

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